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SHORT COMMUNICATION

DISTRIBUTION OF FLAVONOIDS IN TWENTY-ONE SPECIES OF *OENOTHERA*

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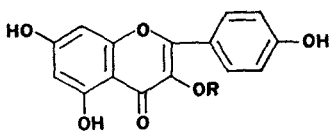
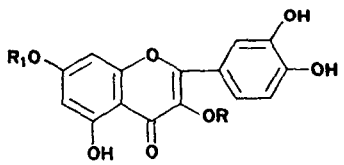
Abstract—Distributional data for 12 flavonoids in 23 taxa of *Oenothera*, 2 species of *Calylophus*, and 1 species of *Gaura* are presented.

THE FLAVONOID chemistry of 23 taxa of *Oenothera* L. (Onagraceae) representing 8 of the 10 subgenera, 2 species of *Calylophus* and 1 species of *Gaura* was investigated in connection with a general biochemical systematic investigation of *Oenothera*. Using standard procedures[1-3] distributional data for the twelve major flavonoids in the taxa were obtained (Table 1).



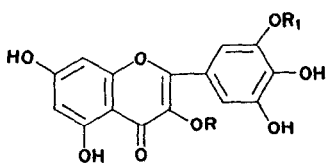
(I)

(Ia) R = glucosyl
(Ib) R = rhamnoglucosyl



(II)

(IIa) R = glucosyl, R_1 = H
(IIb) R = galactosyl, R_1 = H
(IIc) R = arabinosyl, R_1 = H
(IId) R = rhamnosyl, R_1 = H
(IIe) R = rhamnoglucosyl, R_1 = H
(IIf) R = CH_3, R_1 = glucosyl



(III)

(IIIa) R = rhamnosyl, R_1 = H
(IIIb) R = galactosyl, R_1 = H
(IIIc) R = arabinosyl, R_1 = H
(IIId) R = CH_3, R_1 = glucosyl

TABLE 1 DISTRIBUTION OF FLAVONOIDS DETECTED IN *Oenothera*

Species	Source of Plant Material	Compounds*									
		K 3-O-glu (Ia)	K 3-O-rha glu (Ib)	Q 3-O-glu (IIa)	Q 3-O-gal (IIb)	Q 3-O-ara (IIc)	Q 3-O-rha (IId)	Q 3-O-rha glu (IIe)	Q 3-O-Me 7-O-glu (IIf)	M 3-O-rha (IIIa)	M 3-O-gal (IIIb)†	M 3-O-ara (IIIc)	M 3'-O-Me 3'-O-glu (IIId)
Subgenus *Hartmannia*													
Oenothera purpusii	Stanford Exptl Garden	+	+	+	+		+						
O desertícola	Stanford Exptl Garden						+			+	+		
O speciosa ($n = 7$)	Stanford Exptl Garden						+			+	+		+
O speciosa ($n = 14$)	Texas, Hidalgo Co						+			+	+		
O kunthiana	Stanford Exptl Garden			+	+		+	+		+	+		
O epilobiifolia	Stanford Exptl Garden			+			+			+	+		
O tetraptera	Stanford Exptl Garden			+	+		+			+	+		
O rosea	Stanford Exptl Garden			+	+		+						
Subgenus *Oenothera*													
O grandiflora	Stanford Exptl Garden	+	+	+	+	+	+	+					
O argillícola	Stanford Exptl Garden	+	+	+	+	+	+	+					
O biennis subsp *caeciarum*	Stanford Exptl Garden	+	+	+	+	+	+						
O biennis subsp *centralis*	Stanford Exptl Garden	+	+	+	+	+	+						
O biennis subsp *austromontana*	Stanford Exptl Garden	+		+	+								
Subgenus *Raimannia* (North American)													
O stricta	Stanford Exptl Garden	+		+	+								
O odorata	Stanford Exptl Garden	+		+	+								
O drummondii	Texas, San Patricio Co			+			+						
O albicaulis	Texas, Dawson Co			+	+								
O organensis	Stanford Exptl Garden	+	+	+	+		+	+					
Subgenus *Kneiffia*													
O tetragona subsp *glauca*	Catholic Univ of Amer					+	+	+		+	+	+	
Subgenus *Anogra*													
O pallida subsp *pallida*	Idaho, Bingham Co	+	+	+			+			+			
Subgenus *Pachylophus*													
O caespitosa subsp *montana*	Utah, Emery Co			+		+				+	+		
O macrosceles	Stanford Exptl Garden												
Subgenus *Megapterium*													
O missouriensis	Texas, Bell Co	+		+	+		+						
Subgenus *Renneria*													
O campylocalyx	Stanford Exptl Garden	+	+	+	+		+						
Calylophus drummondianus	Texas, Travis Co	+		+	+				+		+		
Calylophus serrulatus	Texas, Dallam Co	+		+	+								
Gaura coccinea	Texas, Dallam Co	+	+	+			+						

* K = kaempferol, Q = quercetin, M = myricetin, Me = methyl ether, sugars abbreviated conventionally
† This compound was also previously isolated from *Calylophus lavandulifolius*, J KAGAN, *Phytochem* **6**, 317 (1967)

Only flavonols were detected in *Oenothera*, *Calylophus* and *Gaura*, with the kaempferol and quercetin types (Ia,b and IIa–f) dominating in the subgenera *Oenothera*, *Raimannia* and *Renneria*, which are generally taken to constitute a closely related group. The more highly oxygenated types based on myricetin (III a–d) are found in most other species

examined, and their presence might therefore represent a primitive characteristic, although observations of more species would be necessary before this point could be confirmed.

The observed distributions of flavonoids tend to support the notions that *Oenothera albicaulis* is more closely related to the North American species of subgenera *Raimannia* than to its traditional allies in subgenera *Anogra* They seem to be in agreement with the idea that the pair-forming *Oenothera purpusii* might be one parent of the widespread complex structural heterozygote *O rosea*, as suggested by their rather close morphological similarity Large differences between subspecies of *O. biennis* and between two closely related species of *Calylophus* would be interesting subjects for further investigation.

EXPERIMENTAL

The plant samples of subgenera *Hartmannia*, *Raimannia* (4 species), *Oenothera*, and *Renneria* were available from Dr Raven's Experimental Garden, Stanford University. The plant material subgenus *Kneiffia* was provided by Dr John De Turck at the Catholic University of America while the collections of *Anogra*, *Pachylophus*, *Calylophus*, *Megapterium*, *Gaura* and 2 species of *Raimannia* were made by the senior author Voucher specimens of all taxa are deposited in the Herbarium, The University of Texas at Austin.

All chemical analyses were carried out by standard procedures,[1-3] spectral, chromatographic and hydrolytic data are recorded in detail elsewhere [4]

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[1] T J Mabry, K R Markham and M B Thomas, *The Systematic Identification of Flavonoids* Springer-Verlag, New York (1970)
[2] K R Markham, T J Mabry and W T Swift, Jr , *Phytochem* **9**, 2359 (1970)
[3] Geraldine Howard and T J Mabry, *Phytochem* **9**, 2413 (1970)
[4] Geraldine Howard, Ph D dissertation, University of Texas at Austin (1970)

Key Word Index—*Oenothera*, Onagraceae, chemotaxonomy; flavonol glycosides